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09/740,664	12/19/2000	Takashi Niwa	S004-4168	3496

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Adams & Wilks
31st Floor
50 Broadway
New York, NY 10004

EXAMINER
LUU, THANH X

ART UNIT	PAPER NUMBER
2878	

DATE MAILED: 02/18/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/740,664	NIWA ET AL.	
	Examin r	Art Unit	
	Thanh X Luu	2878	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 February 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-49* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-28 and 33-49* is/are rejected.

7)☒ Claim(s) *29-32* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 December 2000* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☒ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *5* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

This Office Action is in response to preliminary amendments filed February 13, 2002. Claims 1-49 are currently pending.

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the tip having a plurality of surfaces having different taper angles of claim 6; a convex portion disposed closer to the free end than the fixed end of claim 16; a convex portion disposed on the second main surface and closer to the fixed end than the tip of claim 17; and a method step of etching including the step of forming a convex portion in the transparent member spaced from the tip of claim 27 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: R1 mentioned on page 13 is not shown in Figure 2. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> **The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.**

5. The term "refractive-index-distribution-type" in claim 9 is a relative term which renders the claim indefinite. The term "refractive-index-distribution-type" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Furthermore, since all lenses have a refractive index, it is unclear if a lens is of refractive-index-distribution-type or not.

6. Claim 17 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 17, Applicant claims two conflicting situations. It is unclear in its given context how a convex portion is closer to the free end than the fixed end, and yet is closer to the fixed end than to the tip; nothing in the figures show of such a configuration.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 1-3, 5, 7, 10, 19-21, 23-25, 33, 39, 41, 43, 45 and 47 are rejected under 35 U.S.C. 102(b) as being anticipated by Okada et al. (U.S. Patent 5,289,004).

Regarding claims 1-3, 5, 7, 10, 19-21, 23-25, 33, 39, 41, 43, 45 and 47 Okada et al. disclose (see Figure 15) a near-field optical probe, comprising: a cantilever (7) having a first main surface (top) and a second main surface (bottom) opposite the first main surface; a base (11) supporting the cantilever at the first main surface; a tip (7a) extending from the second main surface of the cantilever and having a microscopic aperture at an end, the tip and the cantilever being formed of a transparent material (see column 18, line 58) having a high transmissivity relative to a wavelength of light generated or detected by the microscopic aperture; and a shade film (160) formed on the second main surface of the cantilever and on a surface of the tip except for the microscopic aperture (see also column 21, lines 25-30). Okada et al. further disclose (see column 18, line 58) the transparent material of the tip and the cantilever are the same and wherein the material is silicon dioxide. Okada et al. also disclose (see Figure 15) the tip has a circular conical shape and the end of the tip is positioned nearly in the same plane as an end surface of the shade film. Okada et al. also disclose (see Figure 12) an introducing/detecting optical system (136, 138) having a lens (124) for

introducing light or detecting light from the probe; a detector (within 138) for detecting a distance between the probe and a sample, the detector having a mirror (142) integral with the lens; and a fine movement mechanism (2) as claimed. In addition, Okada et al. disclose (see Figure 14; not shown in Figure 15) a lens (near 136) for focusing incident light to the microscopic aperture. Also, Okada et al. disclose (see Figure 12; not shown in Figure 15) an introducing (136 or within 138)/detecting (136, within 138) optical system for introducing light to the microscopic aperture of the probe or detecting light of the probe; a detecting device (138) for detecting a distance between the aperture and a sample, the detecting device having a light source (within 138) and a detector (within 138) extending in a plane disposed generally perpendicular to the cantilever of the probe or the detecting a distance by detecting an interference (interferometer) between the cantilever and an optical fiber (134); a fine movement mechanism (2) for finely moving the sample and wherein the detector detects light emitted from the light source and reflected by the cantilever (120 on cantilever).

9. Claims 1, 7, 9, 10 and 34, as understood, are rejected under 35 U.S.C. 102(e) as being anticipated by Shimada et al. (U.S. Patent 6,335,522).

Regarding claims 1, 7, 9, 10 and 34, Shimada et al. disclose (see Figures 12-14) a near-field optical probe, comprising: a cantilever (2) having a first main surface (top) and a second main surface (bottom) opposite the first main surface; a base (1) supporting the cantilever at the first main surface; a tip (at 4) extending from the second main surface of the cantilever and having a microscopic aperture at an end, the tip and the cantilever being formed of a transparent material (27a, 27b) having a high

transmissivity relative to a wavelength of light generated or detected by the microscopic aperture; and a shade film (5) formed on the second main surface of the cantilever and on a surface of the tip except for the microscopic aperture. Also, Shimada et al. disclose (see Figure 14) a lens (301 or 7) for focusing incident light to the microscopic aperture, wherein the lens has a refractive index. Shimada et al. further disclose (see column 14, line 38) the tip is generally pyramidal-shaped and the end of the tip is positioned nearly in the same plane as an end surface of the shade film (see Figure 13F).

10. Claims 1, 2, 10, 34 are rejected under 35 U.S.C. 102(b) as being anticipated by Majumdar et al. (U.S. Patent 5,581,083), hereinafter, Majumdar '083.

Regarding claims 1, 2, 10, 34, Majumdar '083 disclose (see Figure 2) a near-field optical probe, comprising: a cantilever (12) having a first main surface (top) and a second main surface (bottom) opposite the first main surface; an inherent base for supporting the cantilever at the first main surface; a tip (14) extending from the second main surface of the cantilever and having a microscopic aperture at an end, the tip and the cantilever being formed of a transparent material (12) having a high transmissivity relative to a wavelength of light generated or detected by the microscopic aperture; and a shade film (16) formed on the second main surface of the cantilever and on a surface of the tip except for the microscopic aperture. The transparent material of the tip and the cantilever are the same. Majumdar '083 further disclose (see Figures 2 and 3) the tip is generally pyramidal-shaped and the end of the tip is positioned nearly in the same plane as an end surface of the shade film.

11. Claims 12-14 and 37 are rejected under 35 U.S.C. 102(b) as being anticipated by Gemma et al. (U.S. Patent 5,675,532).

Regarding claims 12-14 and 37, Gemma et al. disclose (see Figures 7 and 8) a near-field optical probe, comprising: a cantilever having a first main surface (upper) and a second main surface (lower) opposite the first main surface, the cantilever being disposed at an inclination angle relative to a surface of a sample; a base (see Figure 8) supporting the cantilever at the first main surface; a tip having a height and extending from the second main surface of the cantilever and having a microscopic aperture at an end; and a shade film (41) formed on the second main surface of the cantilever and on a surface of the tip except for the microscopic aperture; wherein when a radius of a light detected by the microscopic aperture and being incident on a detector is R1, a distance L1 from a center of the tip to a free end of the cantilever satisfies the claimed equation (see Figure 7 and 8). Gemma et al further disclose (see Figure 7) an end of the cantilever has a slant portion extending from the first main surface to the second main surface or vice versa and the tip is generally conical-shaped.

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

13. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Majumdar '083.

Regarding claim 11, Majumdar '083 further disclose (see Figures) an end portion of the tip protrudes from an end face of the shade film. Majumdar '083 does not specifically disclose the amount of protrusion is equal to or smaller than half of a wavelength of incident light. However, it is notoriously well known in the art to make the apertures of such probes smaller than half the wavelength of incident light to provide improved resolution. Thus, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide the protrusion as claimed in the apparatus of Majumdar '083 to improve imaging and to increase the resolution.

14. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shimada et al.

Regarding claim 8, Shimada et al. disclose the claimed invention as set forth above. Shimada et al. do not specifically disclose the lens comprises a fresnel lens. However, Shimada et al. do teach (see column 2, line 15-16) a probe having a fresnel lens as claimed. Shimada et al. further recognize (see column 2, line 38) that fresnel lens are advantageous in that the lenses can be easily manufactured by lithography. Thus, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide a fresnel lens as claimed in the apparatus of Shimada et al. to provide a probe that is easier to manufacture.

15. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over either one of Okada et al., Shimada et al. or Majumdar '083.

Regarding claim 4, Okada et al. or Shimada et al. or Majumdar '083 disclose the claimed invention as set forth above. Okada et al., Shimada et al and Majumdar '083

do not specifically disclose the material of the tip and the cantilever having different optical characteristics. However, the choice of materials is a matter of design choice. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide different materials for the tip and cantilever in the apparatus of Okada et al., Shimada et al. or Majumdar '083 to provide a desired effect (reduce or weight, or harden or soften the tip).

16. Claims 6, 35 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over either one of Okada et al. or Shimada et al. in view of Hillner et al. (U.S. Patent 5,479,024).

Regarding claims 6, 35 and 36, Okada et al. and Shimada et al. disclose the claimed invention as set forth above. Okada et al. further disclose a conical tip. Shimada et al. also disclose a pyramidal tip. Okada et al. and Shimada et al. do not specifically disclose the tip has a plurality of surfaces having different taper angles. Hillner et al. teach (see Figure 5) a similar probe in which the tip has a plurality of surfaces having different taper angles. Hillner et al. recognize that such a near field probe may have different shapes or taper angles as desired. Thus, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide such a tip in the apparatus of Okada et al. or Shimada et al. as desired for better coupling with the sample.

17. Claims 34, 40, 42, 44, 46 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okada et al. in view of Shimada et al.

Regarding claims 34, 40, 42, 44, 46 and 48, Okada et al. disclose the claimed invention as set forth above. Okada et al. do not specifically disclose the tip being pyramidal in shape. Shimada et al. teach of a similar probe in which the tip is pyramidal in shape. Shimada et al. recognize that either a conical or pyramidal shaped tip functions equivalently. Thus, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide a pyramidal shaped tip in the apparatus of Okada et al. in view of Shimada et al. as desired.

18. Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gemma et al. in view of Shimada et al.

Regarding claims 38, Gemma et al. disclose the claimed invention as set forth above. Gemma et al. do not specifically disclose the tip being pyramidal in shape. Shimada et al. teach of a similar probe in which the tip is pyramidal in shape. Shimada et al. recognize that either a conical or pyramidal shaped tip functions equivalently. Thus, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide a pyramidal shaped tip in the apparatus of Gemma et al. in view of Shimada et al. as desired.

19. Claims 12 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Quate (U.S. Patent 5,354,985), hereinafter, Quate '985 in view of Gemma et al.

Regarding claims 12 and 15, Quate '985 discloses the claimed invention except for inclining the cantilever at an angle. Quate '985 further discloses a second portion (26) extending along a plane parallel to the first main portion (23) and a connecting portion (14, 15, 20) extending in a direction opposite the direction of the extension of the

tip and connecting the first and second portion. Gemma et al. teach inclining a cantilever for near field probing. It would have been obvious to a person of ordinary skill in the art at the time the invention was made incline the cantilever in the apparatus of Quate '985 in view of Gemma et al. to obtain better positioning of the probe with respect to a sample.

20. Claims 12, 16 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimada et al. in view of Gemma et al.

Regarding claims 12, 16 and 18, Shimada et al. disclose the claimed invention except for inclining the cantilever at an angle. Shimada et al. further disclose a convex portion (7) disposed closer to the free end than the fixed end and on the first main surface of the tip. Gemma et al. teach inclining a cantilever for near field probing. It would have been obvious to a person of ordinary skill in the art at the time the invention was made incline the cantilever in the apparatus of Shimada et al. in view of Gemma et al. to obtain better positioning of the probe with respect to a sample.

21. Claims 26-28 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirokane et al. (U.S. Patent 5,767,891) in view of Quate (U.S. Patent 5,633,455), hereinafter, Quate '455.

Regarding claims 26 and 27, Hirokane et al. disclose (see Figures 9a-9e) a method for manufacturing a near-field optical probe, comprising: providing a transparent member (1); etching part of the transparent member to form a tip (see Figure 9c); and forming a shade film (2) over the tip except for an end portion of the tip. Hirokane et al. further disclose (see Figure 22a-22f) forming a convex portion (100) in the transparent

member spaced from the tip. Hirokane et al. do not specifically disclose forming a mask and etching to form a lever or etching a substrate to form a base. However, Hirokane et al. also disclose mass producing the probes. Quate '455 teaches (see Figure 6I) forming a mask over a tip and etching to form a lever. Quate '455 further teaches (see Figure 6K) etching on another side to form a base. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to further form a mask and etch to form levers in the method of Hirokane et al. in view of Quate '455 to form individual probes. Furthermore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to etch the other side of the member to from a base in the method of Hirokane et al. in view of Quate '455 to easier mount the probe.

Regarding claims 28 and 49, Hirokane et al. and Quate '455 disclose the claimed invention as set forth above. Hirokane et al. further disclose (see column 6, line 50) isotropic etching. Hirokane et al. and Quate '455 do not specifically disclose creating a slant on the lever. However, the specific shape of the lever is a matter of design choice. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide a slant in the lever of Hirokane et al. in view of Quate '455 as desired.

Allowable Subject Matter

22. Claims 17 and 29-32 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

23. The following is a statement of reasons for the indication of allowable subject matter: a probe and method of manufacturing a probe as claimed, more specifically in combination with: a convex portion disposed on the second main surface, wherein the convex portion is less than the height of the tip; forming a step portion on the substrate before providing the transparent member; and burying a weight material in the step portion is not disclosed or made obvious by the prior art of record.

Conclusion

24. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh X. Luu whose telephone number is (703) 305-0539. The examiner can normally be reached on Monday-Friday from 6:30 AM - 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta, can be reached on (703) 308-4852. The fax phone number for the organization where the application or proceeding is assigned is (703) 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

txl
February 4, 2003

Thanh X. Luu
Patent Examiner